

almost constant rate of increase of velocity of about nine miles per hour per 5000 feet, except in the first few thousand feet, where the rate of increase is slightly higher. Chart 3 shows that the maximum velocity in winter is greater than that in summer, the difference increasing considerably with height. In charts 6 to 9 effective use is made of isopleths, or lines that show the variations of a quantity which is dependent upon two others. The simplest example of a diagram of isopleths is probably afforded by an ordinary contour map, showing the dependence of height upon position. In these charts, however, the three quantities represented are all of different dimensions; thus, charts 7 and 8 show how velocity varies with height and season, and with height and time of day, respectively.

In charts 10 to 19 are represented by means of wind-roses the percentage frequency and velocity of winds of all directions at heights ranging from 650 feet (ground level) to 10,000 feet at Blue Hill. The results for 650 feet are deduced from hourly observations made at the observatory; those for greater heights are obtained from 230 kite ascents made during fifteen years, on occasions when the velocity was more than ten and less than seventy miles per hour, this being the condition necessary for kite-flying. The results are similar to those obtained at Lindenberg, near Berlin, by Prof. Assmann, the main features being the ultimate decided preponderance of westerly and north-westerly winds in summer and winter respectively, and the gradual increase of velocity with height for all directions.

Chart 21 correlates the preceding ten charts by indicating how to pass from those drawn for one level to those for the next higher level; it shows how to forecast the average upper winds from a knowledge of the surface wind and the prevailing atmospheric circulation, taken to be either cyclonic or anticyclonic. To the aeronaut and aviator this problem must ever be of great importance.

The next charts give wind-roses for the region of the north-east trade wind, and indicate clearly the existence of the south-west anti-trade. These results are derived from 715 observations of direction and velocity in sixty-seven balloon ascents made during four expeditions by M. Teisserenc de Bort and Prof. Rotch on board the *Otaria*.

The volume concludes with a chart giving two summer airship tracks across the Atlantic; one from Boston to London in the region of prevailing westerly winds, the other from Lisbon to the West Indies through the trade wind area. This chart will be of much interest to aeronauts who wish to emulate the example of Messrs. Wellman and Vaniman.

The facts set out should become familiar to the meteorologist as well as to the airman. To the latter, the charts represent, so to speak, the wind-climate of the region in which his craft move, and they are consequently of importance to him. They will not assist him to forecast the likelihood of dangerous phenomena like line-squalls—for that information he must look elsewhere—but as these exceptional occurrences are comparatively infrequent, the average state of the atmosphere as represented on the charts is also usually a reasonable guide to the conditions to be expected on a particular occasion.

Prof. Rotch was a pioneer in the development of modern methods of upper-air research, and this work will be welcomed by all who are interested in the practical and theoretical problems of the atmosphere.

R. C.

FIRST AID ON THE FARM.

Veterinary Studies for Agricultural Students. By Prof. M. H. Reynolds. Pp. xix + 290. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1910.) 7s. 6d. net.

IT is no easy task to write a useful work on elementary veterinary science for laymen, for we venture to say that in no other science does the old proverb apply so obviously, viz., "A little knowledge is dangerous." We must candidly admit, however, that the task has been admirably accomplished by the author of the work under review. That the work should have run into seven editions in seven years speaks for itself.

Roughly speaking, the book is divided into six sections, viz.: Anatomy and Physiology, Pathology, Causes and Prevention of Disease, Infectious Diseases, Non-infectious Diseases, and Obstetrics. The bearing of the earlier sections on the later ones is obvious, for one must of necessity be able to recognise the normal conditions before being able to detect departures from the normal. The author rightly sounds a note of warning against "the blind home-dosing of stock to which farmers and stockmen are very much inclined," and frequently in the course of the book he warns the owners for their own sakes not to attempt treatment of any other than the simpler ailments. On the other hand, where skilled veterinary assistance is not available, the information given in this book may be of very great service. The chapters on disinfection and ventilation are especially good.

It would be a very remarkable book indeed in which no faults could be found, and the criticisms we offer are in the hope that they may be borne in mind when another edition is called for. On

page 12 the sesamoid bones are described as being "triangular." Their shape is more correctly "pyramidal." In connection with the description of the stomach of the ruminant, it would be an advantage if it were dealt with a little more fully. At present the description is far too meagre to be of any service. On p. 92 a list of hereditary diseases is given as scheduled by the Minnesota Stallion Law. Navicular disease is not included, although there is ample evidence of its hereditary nature. Laminitis is probably debatable as a hereditary disease, but it might be included in such a list of undesirable points with advantage, for the conformation so commonly associated with it is undoubtedly hereditary. The make-up of chapter xx. seems to us to have got rather mixed, for the two first paragraphs of p. 92 referring to heredity would be more appropriately placed to follow the paragraph on in-and-in breeding on p. 90, instead of being sandwiched between paragraphs referring to air.

The chapter on Actinomycosis is very good indeed, although we should be very sorry to see anybody, farmer or veterinary surgeon, resort to the caustic line of treatment as outlined on p. 149, especially as better results can be obtained by internal medication without producing the same amount of pain and suffering.

The illustrations throughout the book are excellent on the whole, though we fail to see any point in the inclusion of Figs. 74 and 75. In neither case is there anything shown at all diagnostic of milk fever.

We have no hesitation in recommending this book to agricultural students, for it should be of great service to them in the pursuit of their veterinary studies.

THE NATURE OF BONE.

Der Aufbau der Skeletteile in den freien Gliedmassen der Wirbeltiere. Untersuchungen in urodelen Amphibien. Von Prof. H. von Eggeling. Pp. vi+324+4 plates. (Jena: Gustav Fischer, 1911.) Mk. 16.

AT the present time the problems relating to the precise nature and mode of development of osseous tissue are being submitted to a searching scrutiny, and many of the most cherished beliefs of the majority of anatomists concerning the process of evolution and the real structure of bone are being threatened. Great activity is being displayed in investigating such problems as the mode of deposition of the calcium salts in the scleroblastema; the precise relationship of this process of calcification to the cells which in a sense determine it; whether there is any fundamental distinction between enchondral and intra-

membranous ossification; and whether bone is really the inert, unchanging tissue one is apt to think essential in a skeletal support.

These problems and others of a similar nature are forcing themselves upon the attention of workers in widely separated fields of biological inquiry. Surgeons like Sir William Macewen, as the result of clinical experience, have been led to question the current accounts of the development of bone; radiographers have been amazed to find how rapidly an acutely-inflamed bone reacts to the inflammatory process and becomes transparent to the X-rays; palæontologists have been puzzled to explain why obviously homologous bones in two amniotes may ossify in different ways, being enchondrous in one and intramembranous in another; anatomists find a difficulty in drawing a sharp line of distinction between enchondrous and intramembranous bone in certain parts of the skeleton; and embryologists and bio-chemists meet with many difficulties when they attempt to explain the precise mode of deposition of the calcium salts and the nature of the tissues in which they are laid down in the process of bone-formation.

Most of the work which hitherto has been done with the object of elucidating these and allied problems has been based mainly upon the investigation of the more highly organised and specialised Amniota. But Prof. von Eggeling has wisely selected for his research the simplest and least modified material he could obtain: he has devoted his whole attention to the investigation of certain specific features of the process of ossification in the limb-bones of the Urodele Amphibia, the most primitive vertebrates possessing limb-bones precisely comparable to those of the Amniota.

His results are presented in the form of this large monograph, packed with a mass of detailed information relating to the ossification of the limb-bones in twenty-four species, representing every family of the Urodela.

He gives a long and minute analysis of the voluminous literature relating to the structure and histogenesis of so-called coarse-fibred and fine-fibred bone; and then sets forth his own observations.

The most primitive osseous tissue is a product of the periosteum, but the dental cement and part of the placoid-organs of Selachians are of the same nature. It assumes its distinctive form by reason of the fact that the scleroblasts develop first amidst a coarse-fibred matrix of connective tissue.

At a later stage, both in phylogeny and ontogeny, buds of vascularised tissue eat their way through the sheath of coarse-fibred bone into the cartilaginous core; and in this loose delicate